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**D1A AFB**

(56) Documents Cited

**GB 2121834 A EP 0001645 A US 5329791 A**

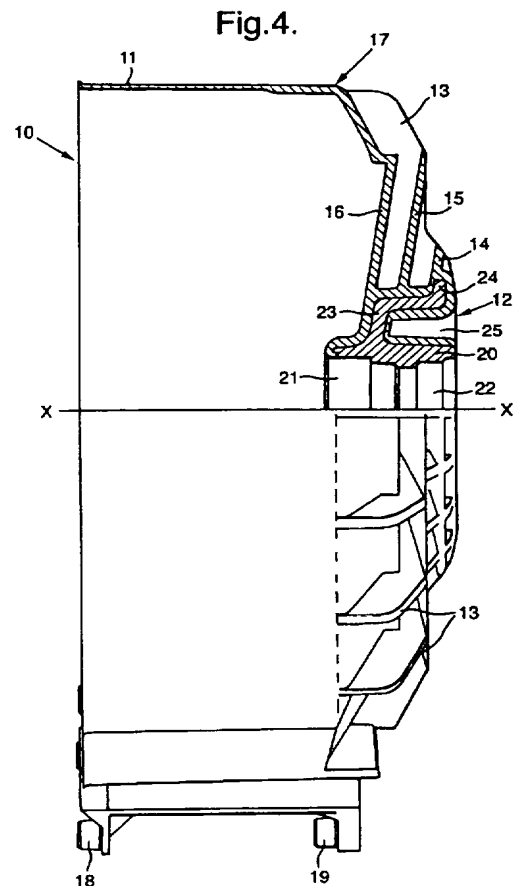
(58) Field of Search

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(54) Abstract Title

**Plastic Washtub**

(57) A tub (10) of a clothes washing machine, which is made from plastics material, comprises at least one end disc (12), in the interior of which is disposed a hub (20) with the seats (21,22) of at least a part of the bearings of the shaft for driving the drum. The end disc (12) which is preferably moulded together with the peripheral casing portion (11) of the tub (10) comprises in the same part, besides the conventional radial ribs (13), one or more reinforcing rings (14,15,16) which extend in planes transverse to the axis (X-X) of the drum drive shaft.



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Fig.2.

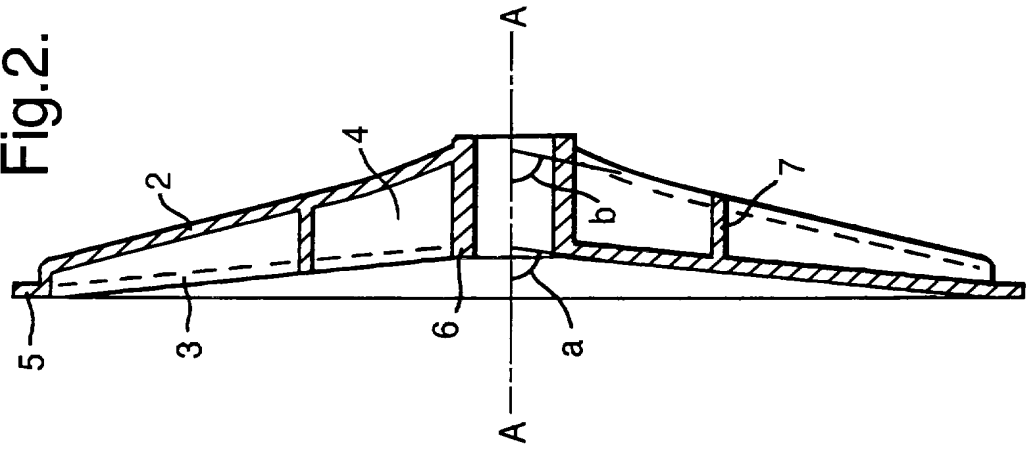


Fig.1.

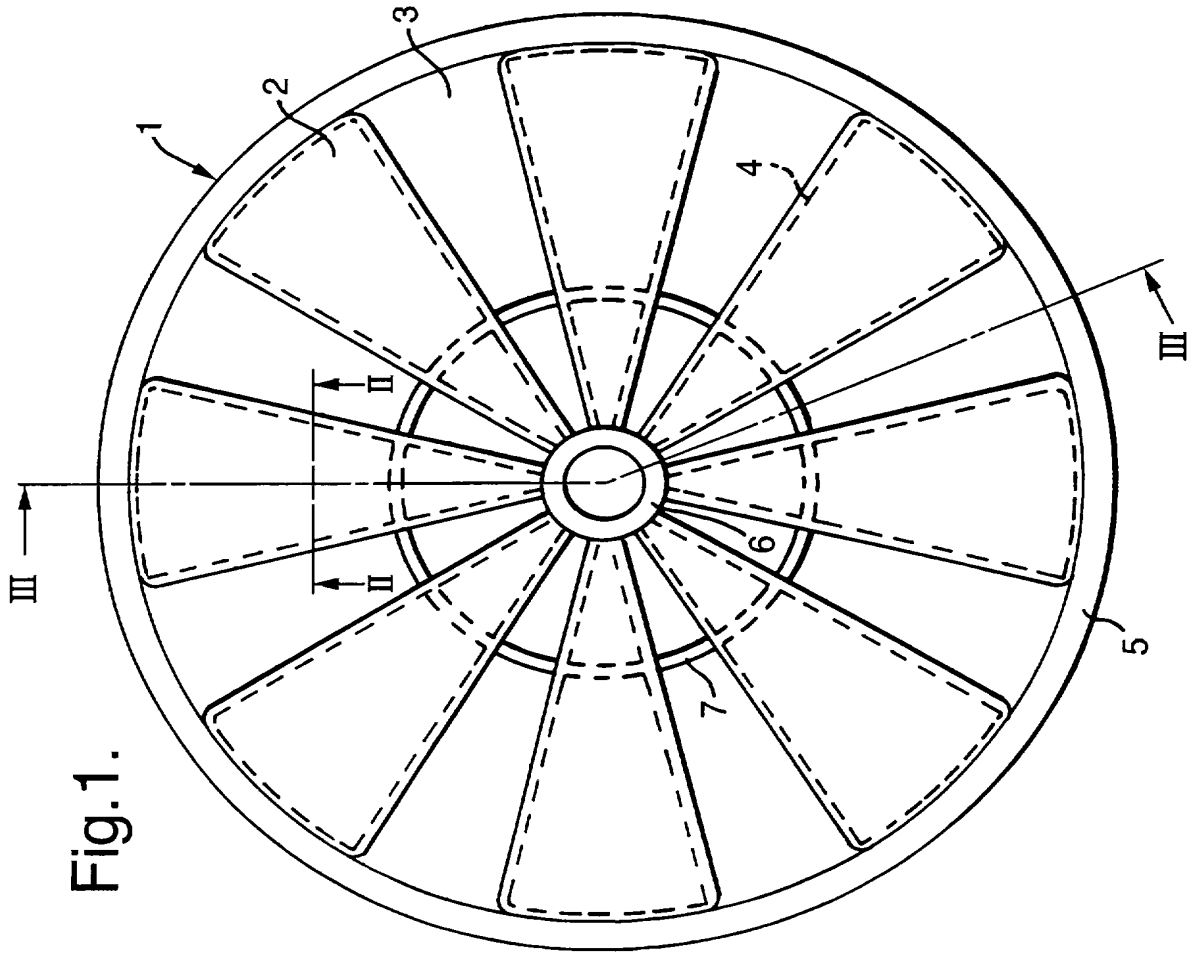


Fig.3.

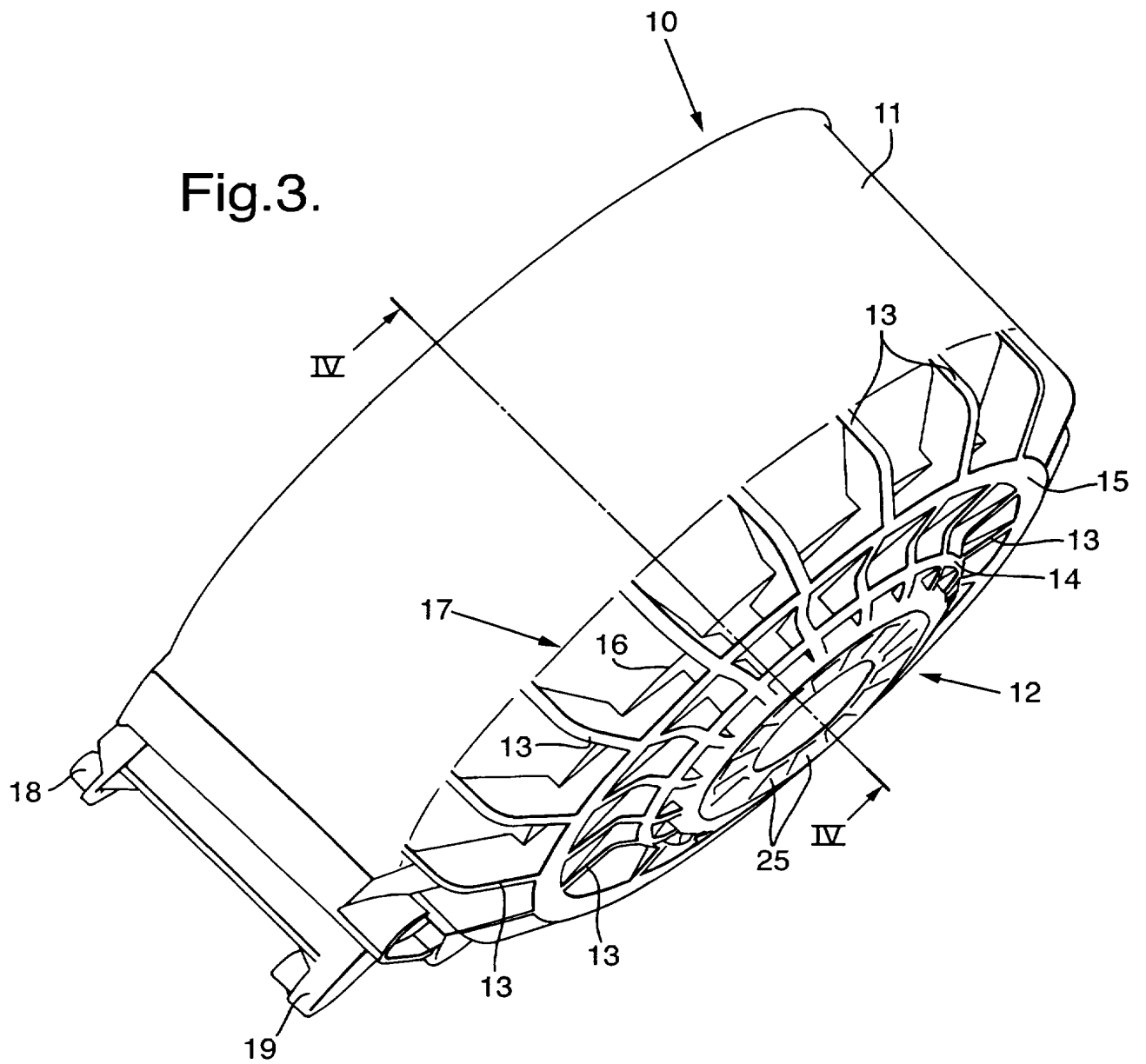
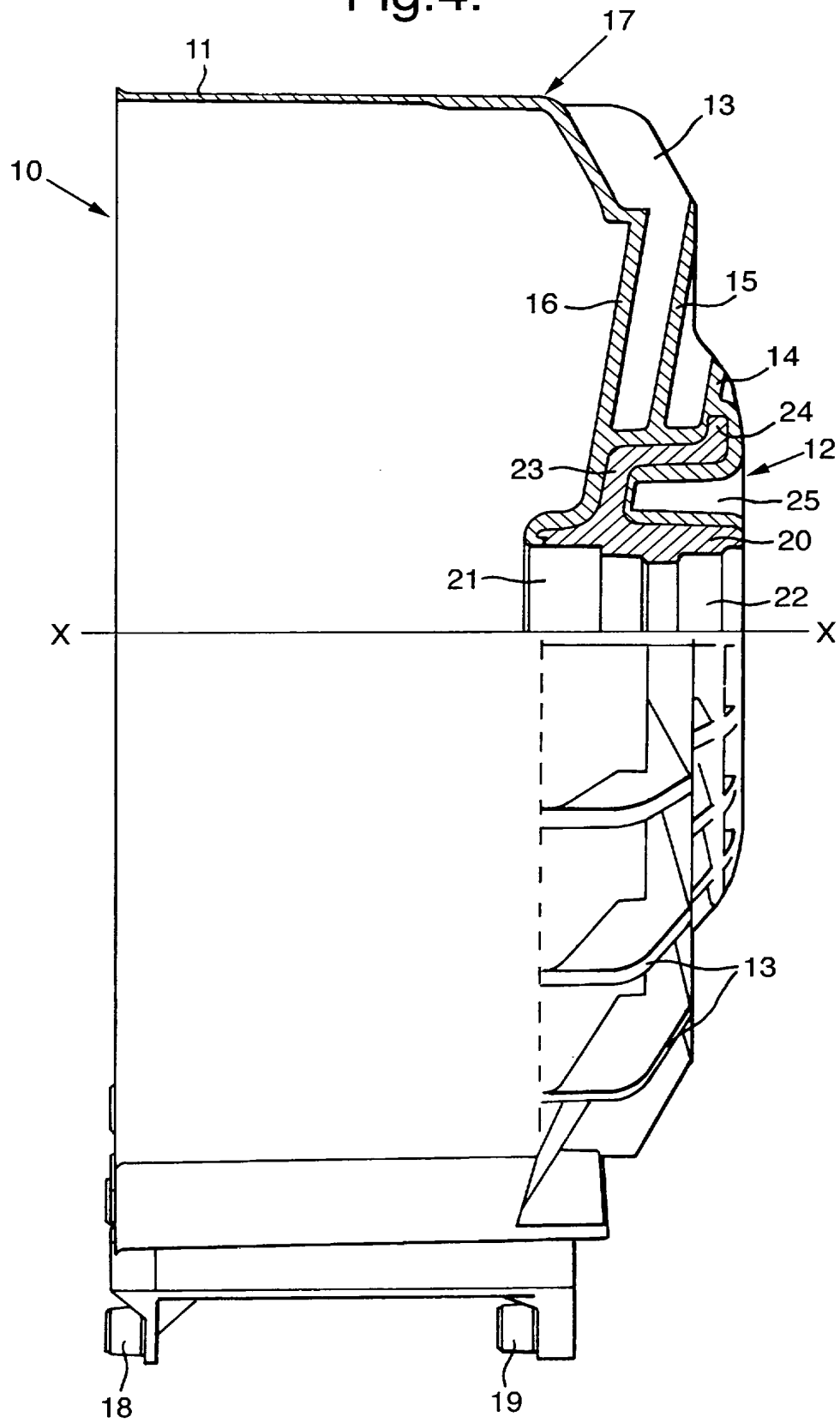


Fig.4.



**IMPROVED PLASTICS TUB  
FOR CLOTHES WASHING MACHINE AND THE LIKE**

The present invention concerns a plastics tub for a clothes washing machine  
5 or similar appliances such as so-called washer-driers.

A tub of this kind which encloses a rotating drum with the laundry to be  
treated consists of a cylinder with a substantially horizontal axis, having a peripheral casing  
portion and two end discs. In the case of front-loading machines the opening for  
introducing and removing laundry is provided on the front disc of the tub while the seats for  
10 the bearings for the shaft of the drum are accommodated in the rear disc, while in the case  
of top-loading machines the opening for the laundry is provided on the peripheral casing  
portion and the bearings are preferably distributed between the front disc and the rear disc.

In consideration of the fact that a clothes washing machine has a useful life  
which can exceed 15 years, a tub must be designed in such a way that, during such a long  
15 period of time, it satisfies functional requirements such as resistance to mechanical stresses  
transmitted from the drum, water-tight sealing integrity and resistance to corrosion.

The tub is also to be suitable for manufacture, both in strictly technological  
and economic terms, and also for recycling when the washing machine reaches the end of its  
useful life.

20 Having recourse to a tub made from plastics material by means of injection  
moulding - see for example EP-A-0043429, EP-A-0219115 and EP-A-0374519 - has given  
optimum results insofar as, with equal levels of performance, it makes it possible to provide  
both for automation to a particularly advanced degree of the process for the production of  
the clothes washing machines and excellent final recycling.

25 A tub of this kind is in fact produced using a single material, excluding the  
screws for making the join between the various parts thereof, and some inserts such as the  
water-tight sealing rings and the seats of the bearings for the shaft of the drum. So that the  
tub is sufficiently strong, a disc with the seat for the bearings is not flat but comprises in one  
piece therewith reinforcing elements which are produced during the injection moulding  
30 procedure.

In this regard the applicants wish to refer, as closer state of the art, to the  
glass fibre-reinforced polypropylene tub for a front-loading clothes washing machine  
described in GB-A-2121834 from which accompanying Figures 1 and 2 have been taken,

showing the rear end disc 1 thereof respectively in elevation and along line III-III in Figure 1. The disc 1 comprises a plurality of sectors 2 and 3 which are alternatively spaced along the axis A-A of the rotating drum, and are inclined at various angles with respect to the axis and are interconnected along their radial edges by axial ribs 4 - see Figure 2.

5                   The disc 1 also comprises as one piece therewith a peripheral flange 5 which joins the sectors 2 and 3 and also the axial ribs 4 and serves as a base for the cylindrical peripheral casing portion (not shown) of the tub, and a hub 6, to the opposite ends of which are joined adjacent sectors, for accommodating the bearings for the shaft. Finally, at about a third of its radius the disc 1 comprises an annular rib 7 which interconnects the various  
10 axial ribs 4.

                  This known construction for the tub is not at all adequate for withstanding serious and complex flexural-torsional stresses such as those which are found to occur in the more recent machines, where the spin speed of the rotary drum can be even higher than 1500 revolutions per minute and the useful load of laundry which can be greater than 5kg is  
15 particularly unbalanced.

                  That inadequacy is particularly apparent in front-loading machines where it is necessary to maintain the maximum axial spacing between the two bearings of the shaft of the drum while having available for that purpose only the lower disc, as mentioned hereinbefore.

20                   When the tub is made from plastics material which requires the parts thereof to be of thicknesses which are necessarily large, the amount of space taken up in the axial direction by the rear disc becomes ever more considerable with respect to a tub made from steel for a clothes washing machine or the like involving the same level of functional performance. This means that, with the plastics tub, a high-performance machine must  
25 involve an external size along the axis of the rotary drum (this is to say depth of the external casing) which is greater than with a tub made from steel. It is clear that this fact, besides preventing maximum standardisation of the production line, can also limit the choice of the potential purchaser when the amount of space available for the clothes washing machine in the place of residence is inevitably limited.

30                   Therefore the main aim of the present invention is to provide an improved tub for a clothes washing machine or the like which, while being made from plastics material and guaranteeing the maximum levels of functional performance, does not suffer from the above-discussed limitations and which consequently is overall interchangeable with tubs

made from steel.

Another aim of the invention is to provide a tub construction made from plastics material, more particularly in respect of the rear disc which accommodates the seats for the bearings of the shaft for the rotary drum, which is in itself ideal both for front-loading machines and for top-loading machines.

According to the present invention there is provided a tub made from plastics material of a clothes washing machine or the like which comprises, a peripheral casing portion and at least one end disc integrally provided with a plurality of external radial reinforcing ribs which tub, when installed in the machine, serves to enclose a rotary drum driven by means of a substantially horizontal shaft, the bearings of which have at least partially seats in a hub disposed in the interior of said end disc, wherein said end disc is also integrally provided with one or more reinforcing rings which extend in planes transverse with respect to the axis of the drum drive shaft.

The invention will be further described by way of non-limitative example with reference to the accompanying drawings, in which:-

Figure 1 is an end elevation of a prior washing tub;

Figure 2 is a section taken on line III-III of Figure 1;

Figure 3 is a perspective view of the peripheral casing portion and the rear end disc of a plastics tub for a domestic front-loading clothes washing machine; and

Figure 4 is a side view of the same part of the tub shown in Figure 3 in which the upper half is sectioned along line IV-IV.

Referring to Figures 3 and 4, a plastic tub 10 for a domestic clothes washing machine according to the invention comprises, besides a front disc (not shown) provided with a central opening for the introduction and unloading of the laundry, a cylindrical peripheral casing portion 11 and a rear disc 12 which are produced in one piece by means of injection moulding. The details relating to sealingly joining the front disc to the peripheral casing portion 11, for example with a plurality of circumferentially distributed screws, are immaterial for the purposes of the present invention and are consequently not set forth in the description and the accompanying drawings.

As is well known, the tub 10 serves to enclose a rotary drum (not shown) which is actuated by an electric motor by means of a shaft (also not shown), the axis X-X of which is substantially horizontal. The motor is suspended below the tub by means of a pair of brackets 18 and 19 which are provided integrally on the peripheral casing portion 11.

The seats 21 and 22 for the bearings for supporting the shaft are part of a metal hub 20 which is disposed in the interior of the end disc 12 and which involves the same axis X-X. There are many different ways of fixing the hub 20 to the end disc 12 - see for example EP-A-0043429, EP-A-0219115, US-A-5329791 and EP-A-0736117 which  
5 belong to the present applicants. In the embodiment shown herein the hub 20 comprises a bell-shaped projection 23 terminating with an annular rim 24 which extends in a plane substantially perpendicular to the axis X-X and remains incorporated in the mass of plastics material of the end disc 12 by means of a process of being injection-moulded therearound, as shown in Figure 4.

10 In accordance with the invention, on its outside surface, the end disc 12 is integrally provided, in addition to a plurality of radial ribs 13 which extend as far as the circular strip portion 17 for connection to the peripheral casing portion 11, with three reinforcing rings 14, 15 and 16 which extend in mutually parallel planes which are transverse with respect to the axis X-X and with which they form an angle of greater than  
15 about 75°, as shown in Figure 4.

In the zone which is between the hub 20 and its bell-shaped protection 23 the end disc 12 is finally integrally provided with a circumferential series of recesses 25 which extend substantially parallel to the axis X-X and which are open towards the outside of the tub. The purpose of the recesses 25 is to lighten the tub and facilitate the injection  
20 moulding process, in particular incorporation of the metal hub 20 in the body of plastics material.

The advantages afforded by the structure described hereinbefore can be summarised as follows:

- the lattice structure formed by the rings 14, 15 and 16 which intersect at  
25 a right angle the radial ribs 13, the free edge of which is correspondingly tapered, is particularly strong for resisting all the mechanical stresses which are transmitted from the rotary drum to the tub, during operation of the clothes washing machine;
- the injection moulding process is made easier, besides the reasons mentioned hereinbefore, by virtue of the fact that the movements of the mould used for  
30 producing the whole of the peripheral casing portion 11 and the rear end disc 12 are effected in a radial direction, and indeed virtually perpendicularly to the axis X-X;
- as is clearly apparent from a comparison between Figure 2 (prior art) and Figure 4 (invention) the distance along the axis X-X between the seats 21 and 22 of the two



bearings of the drum drive shaft is definitely large, with beneficial effects on the stability of the clothes washing machine but without appreciably altering the functional performance thereof and without repercussions on its outside size (depth).

Even if the construction described hereinbefore is a preferred embodiment, it  
5 will be appreciated that the men skilled in the art can derive therefrom other constructions which are equally protected by the present patent. In particular the front end disc of the tub of a top-loading clothes washing machine may be of the same characteristics as described and illustrated with reference to the rear end disc in the case where the bearing of the drum drive shaft are distributed between the two discs.

## CLAIMS

1.           A tub made from plastics material of a clothes washing machine or the like which comprises, a peripheral casing portion and at least one end disc integrally provided  
5   with a plurality of external radial reinforcing ribs<sup>1</sup> [which tub] when installed in the machine, serves to enclose a rotary drum driven by means of a substantially horizontal shaft, the bearings of which have at least partially seats in a hub disposed in the interior of said end disc, wherein said end disc is also integrally provided with one or more reinforcing rings which extend in planes transverse with respect to the axis of the drum drive shaft.  
10
2.           A plastics tub according to claim 1 where the peripheral casing portion, the discs and the or each reinforcing means are moulded in one piece.
3.           A plastics tub according to claim 1 or 2, wherein said reinforcing rings  
15   extend in mutually parallel planes.
4.           A plastics tub according to claim 1, 2 or 3, wherein said reinforcing rings extend in planes which form an angle of greater than about  $75^\circ$  with respect to the axis of the drum drive shaft.  
20
5.           A plastics tub according to any one of the preceding claims, wherein said hub comprises a bell-shaped projection having a final annular rim which extends in a plane substantially perpendicular to the axis of the drum drive shaft and remains incorporated in the mass of plastics material of said end disc by means of a process of injection moulding  
25   around same.
6.           A plastics tub according to any one of the preceding claims, wherein in the region between said hub and the first reinforcing ring said end disc is integrally provided with an plurality of recesses which extend substantially parallel to the axis of the drum drive  
30   shaft and are open towards the exterior.
7.           A plastics tub substantially as hereinbefore described with reference to and as illustrated in Figures 3 and 4 of the accompanying drawings.

8. A clothes washing machine incorporating a plastics tub according to any one of the preceding claims.



Application No: GB 9901063.9  
Claims searched: 1 - 8

Examiner: Andrew Jenner  
Date of search: 27 April 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): D1A: AFA, AFB, AFC, AFX, AX

Int Cl (Ed.6): D06F: 37/02, 37/26, 39/12, 49/02

Other: EPODOC, World Patents Index, PAJ

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2121834 A REED INTERNATIONAL PLC.	
A	EP 0001645 A2 FISHER & PAYKEL LTD.	
A	US 5329791 ZANUSSI ELETTRODOMESTICI S.P.A.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.